

# **Airborne Toxic Control Measure on Composite Wood Products**

Public Workshop

June 20, 2006

1001 I Street  
Sacramento, California



California Environmental Protection Agency

**Air Resources Board**

## **Meeting Agenda**

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- Background on ATCM
- Update on Regulation Order
- Performance Standards–BACT Assessment
- Health Risk Assessment
- Enforcement Provisions
- Economic Impacts
- Comments on Regulation
- Next Steps



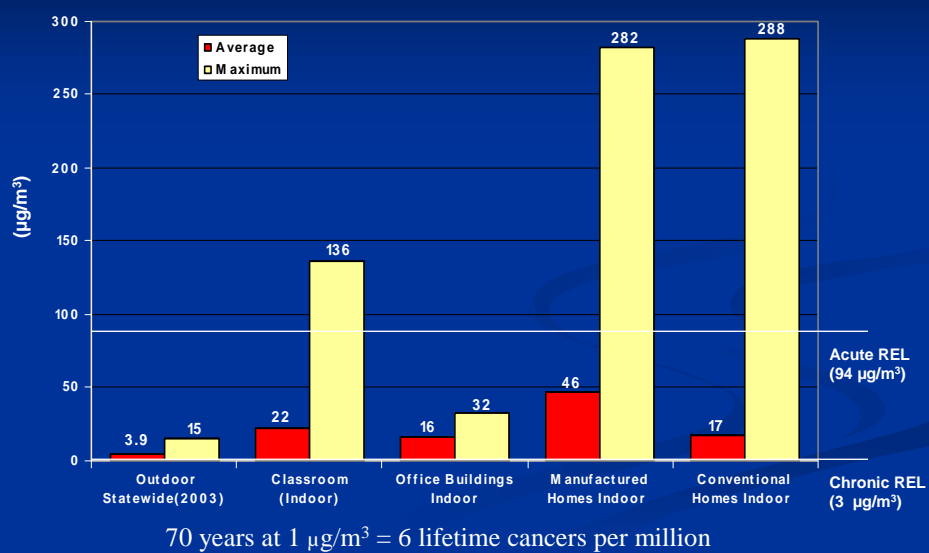
## California Health & Safety Code Requirements

- § 39657 – Requires ARB to identify toxic air contaminants; identify minimum threshold level if any
- § 39658 – Requires ARB to develop Air Toxic Control Measures (ATCMs)
- § 39660.5 – Requires ARB to assess California's indoor exposure to toxic air contaminants (TACs) and the relative contribution to total exposure
- § 39665 – Requires ARB to prepare a report on the need and appropriate degree of regulation
- § 39666 – For compounds with no threshold level, the HSC requires the development of control measures based on best available control technology, or more effective controls in consideration of costs and risk

## Why is Formaldehyde a Concern in California?

- ARB Identified as TAC in 1992; no safe threshold  
Nasopharyngeal cancer: URF = 6 cases/million  
(1  $\mu\text{g}/\text{m}^3$ , 70 years exposure)
- Formaldehyde identified as a HAP by the U.S. EPA  
B1 cancer classification – probable human carcinogen  
Nasopharyngeal cancer: URF = 13/million  
(1  $\mu\text{g}/\text{m}^3$  per 70 year exposure)
- Classified as Group 1 by IARC – known human nasopharyngeal carcinogen
- Acute eye irritation over 94  $\mu\text{g}/\text{m}^3$  (1 hr. avg. aREL)
- Chronic respiratory health problems over 3  $\mu\text{g}/\text{m}^3$  (annual avg. cREL)

## What are Typical Formaldehyde Levels?



## Emissions and Exposure

- Statewide formaldehyde emissions
  - TPY
    - Mobile sources – 16,185 (77%)
    - Stationary Sources – 2,871 (14%)
    - Area sources – 1,976 (9%)
- Exposure levels
  - 2004 statewide average ambient – 3.3 µg/m³
  - Indoor air range – 16 to 290 µg/m³

## Why Composite Wood Products?

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- Risk levels due to formaldehyde are elevated
  - SB 25 (Tier II)– Children’s Environmental Health Protection Act
- CWPs contribute to outdoor concentrations (shipping, inventories, potential near source)
- Major source of personal exposure to formaldehyde
  - Formaldehyde levels indoors typically 2 to 10 times those outdoors
  - Over 85% of time indoors for most Californians
  - More than 90% of exposure to formaldehyde occurs indoors
- Opportunity to reduce formaldehyde exposures

## Update on Regulation Order

## ATCM Regulation Order

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- Draft Released on May 1, 2006
- Suggestions were received at a number of public and one-on-one meetings with stakeholders
- A limited number of written comments were received

## Issues Raised

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- Technology assessment – Phase 2 Standards
- Proposed emission standards – need for mfg. flexibility
- New emission standard– Composite–core HWPW
- Implementation schedule
- Enforcement to maintain “level playing field”

## Issues Raised (cont'd)

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- Exemption for non-UF resins
- Specific text regarding HUD federal pre-emption
- Requirements for Third Party Certification
- Chain-of-custody requirements
- Timing of regulatory development

## ATCM Revisions

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- Adjusted cap performance stds. to account for process variability
- Exclusion for non-UF resins under phase 1 requirements
- Proposing new std. for composite-core HWPW
- Clarified language relative to products subject to the HUD standards
- Added specificity to delineate violations of the ATCM

## ATCM Revisions (Cont'd)

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- Added language on the structure of the emission standards
- Added specificity for Third Party Certification
- Added specificity to recordkeeping requirements
- Identified other chain-of-custody programs that comply with the ATCM requirements

## Performance Standards

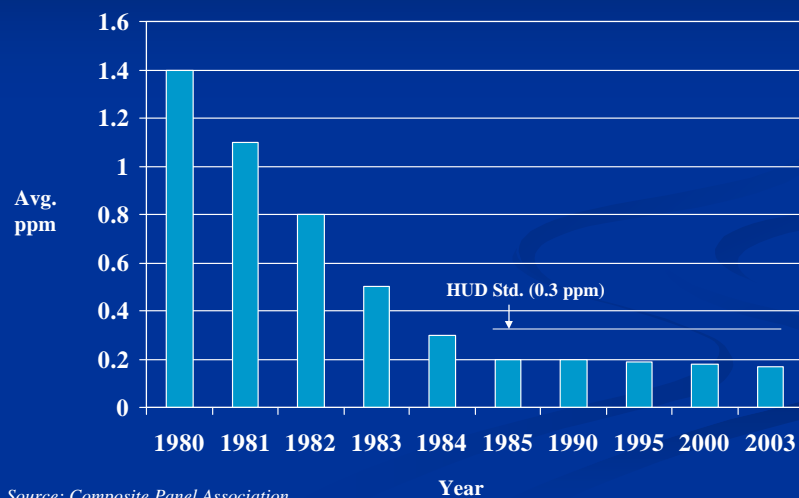
Best Available  
Control Technology  
(BACT)  
Assessment

## Best Available Control Technology Evaluation

H&S Code Section 39666 requires ARB to reduce emissions through application of best available control technology, or a more effective control method, considering technological feasibility and cost

- 2002 product survey
- Personal contacts
- ARB research— patent searches, technical literature
- Evaluation of manufacturing processes— site visits, technical literature, ARB survey

## Historical Formaldehyde Emissions from Particleboard





## 2002 Composite Wood Product Survey

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- Nationwide Distribution (37 Major Producers)

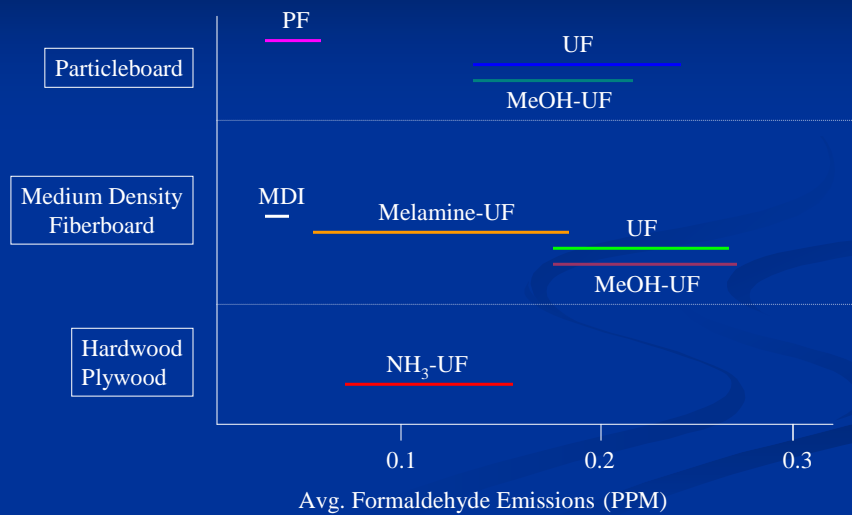
	<i>Annual Production (<math>\times 10^6</math> M<sup>3</sup>)</i>		
	ARB Survey	Industry reference	% Response
Particleboard	5.1	9.6	53
MDF	2.9	3.5	83
HWPW	1.3	1.8	73

## 2002 CWP Survey *Manufacturing Process*

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- Manufacturing flowcharts very similar
- Variation in process equipment mfrs. & vintage  
Plant closures have led to reuse of old equipment
- Presses  
Different types in use today (multi-opening, continuous, steam heated, conventional)
- Blenders  
Older equipment have basic designs  
Newer models have lower maintenance; resin use savings
- Four mfrs. reported HCHO post treatment

## 2002 CWP Survey- *Resin Use*



## 2002 CWP Survey *Resin Systems*

- UF (52% of responses reported use)
  - ~20% use low UF co-blends
  - ~30% use catalysts & scavengers
  - ~8% use post treatment
- UF-MeOH (27% of responses reported use)
  - 50% use low UF co-blends
  - 50% use catalysts
  - ~30% use scavengers
- AUF (19% of responses reported use)
- MUF (10% of responses reported use)
- PF (8% of responses reported use)
- PRF (4% of responses reported use)
- MDI (2% of responses reported use)

## Median avg. HCHO Concentrations *2002 ARB Survey*

	Median of avg. HCHO concentrations
Particleboard	0.18 ppm
Medium Density Fiberboard	0.25 ppm
Hardwood Plywood	0.09 ppm

## Worldwide Standards for Wood-Based Panels

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- United States
  - 1985 HUD standards; voluntary
  - New ASTM/ANSI specifications under review
- Europe
  - E1 standards for plywood and particleboard are about half of the HUD standards
- Japan (F\*\* – F\*\*\*\*)
  - F\*\*\* standard is stringent, technology-forcing for some products
  - F\*\*\*\* standard represents de minimis levels

## Proposed Standards

### *Phase 1*

	Proposed Std. (ppm)	Mfgs. meeting proposed std.
	Effective Date	
Particleboard	0.18	45%
	July 1, 2008	
Medium Density Fiberboard	0.21	40%
	July 1, 2008	
Hardwood Plywood	0.09	85%
	July 1, 2008	

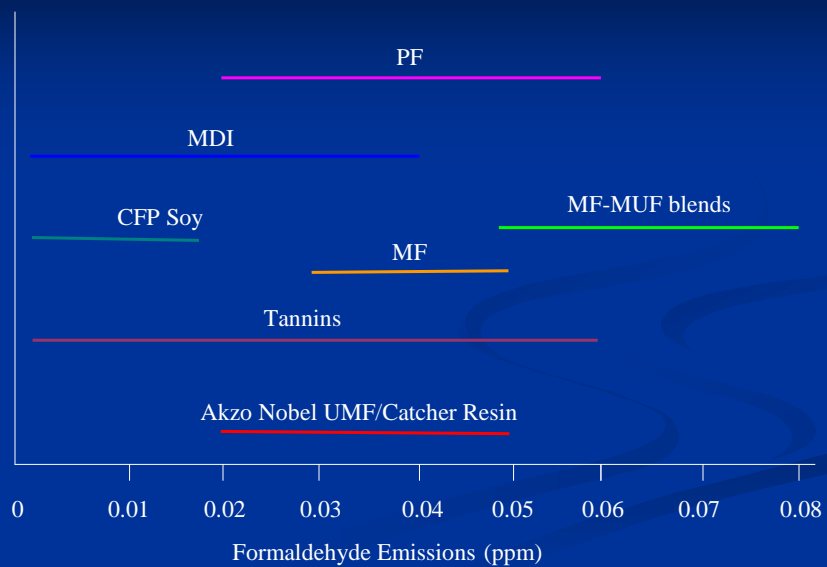
## BACT for Phase 1 Compliance

- Low F/U molar ratio copolymer blends
- Adjust UF resin additives
  - scavengers
  - catalysts

## Proposed Standards *Phase 2*

	Proposed Standard (ppm)	Effective Date
Particleboard	0.08	July 1, 2010
Medium Density Fiberboard	0.08	July 1, 2012
Hardwood Plywood	0.03	July 1, 2010

## Low Formaldehyde Resin Technology



## BACT for Phase 2 Compliance

### *Particleboard and MDF*

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- MUF resin/catcher system
  - low F/U molar ratio
- PF
- MDI
- Tannin technology

## BACT for Phase 2 Compliance

### *Hardwood Plywood*

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- MDI
- PVA
- Soy-based
- PF
- MUF-UF blends
- MUF/catcher

## Closing Comments

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### Phase 1

- Creates products for California comparable with international standards

### Phase 2

- Technology forcing

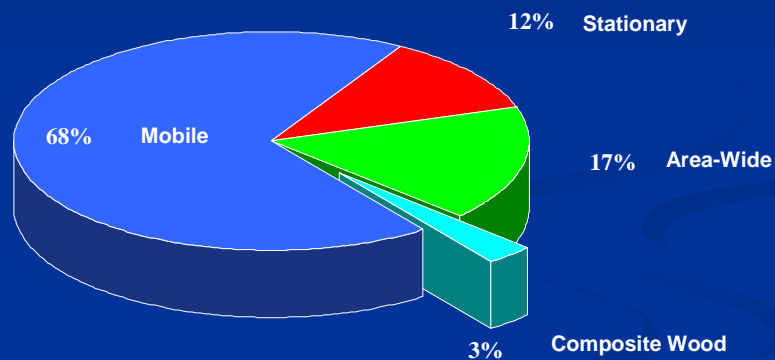
Health Risk  
Assessment

## HCHO Exposure and Risk

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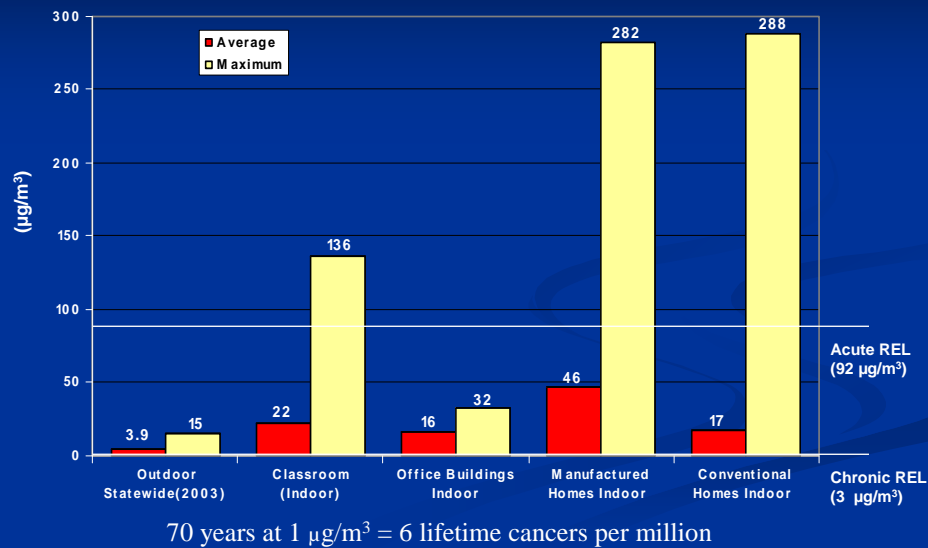
- Exposures to HCHO occur continuously throughout the day
- Health risks are due to cumulative exposures that occur when people breathe HCHO in indoor and outdoor settings
- Exposure assessment requires consideration of activity patterns to see where/when exposures occur

## Outdoor Sources of HCHO Emissions





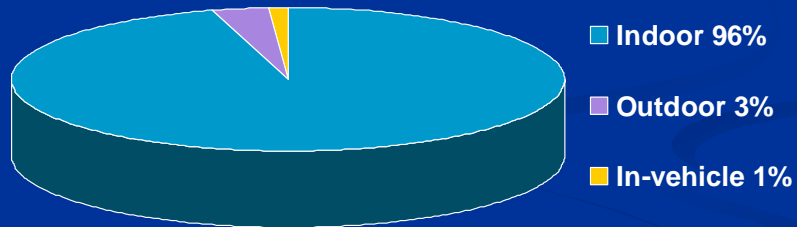
## What are Typical Formaldehyde Levels?



## Daily Activity Patterns

- On average, people spend 85% or more of each day indoors
- HCHO concentrations are considerably higher indoors vs. outdoors
- HCHO concentrations from composite wood products lead to direct human exposure

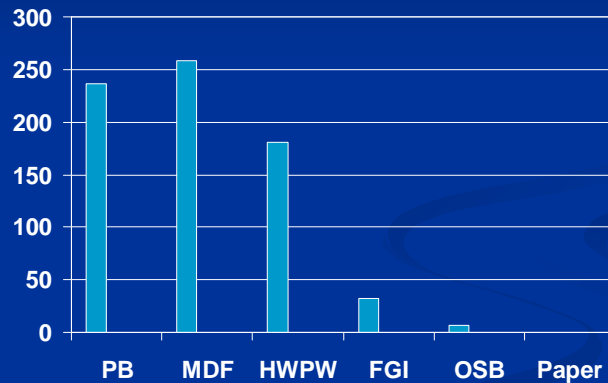
## Average Daily HCHO Exposure



## Outdoor Risk

- Some HCHO emissions that originate indoors end up outdoors
- Potential “hot spots” or near-source locations may be of concern
- CARB modeling estimate of emissions from a lumberyard
  - Est. excess cancer risk = 3 per 10-million

## HCHO Emission Rates from Selected Products ( $\mu\text{g}/\text{m}^2/\text{hr}$ )



## CARB Risk Assessment

- Based on how much a person's total daily HCHO exposure is reduced by the ATCM
- Key inputs are time spent in different locations and representative HCHO concentrations
- Total daily HCHO doses are calculated and time-weighted average HCHO concentrations determined
- Cancer risk is calculated as a function of time-weighted average HCHO concentration  
(Risk =  $\Delta\text{HCHO}$  concentration  $\times$  Unit Risk Factor)

## Daily HCHO Exposure -- Child

Location	Time (hr)	HCHO ( $\mu\text{g}/\text{m}^3$ )	Exposure (%)
In-home	14	17.2	59
In-Other	6	24.6	37
Outdoors	3.5	3.7	3
In-vehicle	0.5	9.6	1
<i>Total</i>	<i>24</i>	<i>-----</i>	<i>100</i>

## Estimated Changes in HCHO Concentrations

Location	Baseline ( $\mu\text{g}/\text{m}^3$ )	Phase 1 ( $\mu\text{g}/\text{m}^3$ )	Phase 2 ( $\mu\text{g}/\text{m}^3$ )
In-home	17.2	14.1	8.6
In-other	24.6	21.7	16.4
TWA-In	19.4	16.4	10.9
TWA-Daily	16.9	14.4	9.9

## Benefits of the ATCM

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- Reduces the total potential HCHO emissions from composite wood products – effective pollution prevention
- Greatest reductions occur in indoor settings where people spend most time
- Achieves slight reductions in toxic and criteria pollutant emissions to ambient air
- Would reduce excess cancers by 15% (phase 1) to 40% (phase 2) from current day exposures

## Enforcement Provisions

## ARB Enforcement Program *Overview*

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- Comprehensive and effective enforcement needed to maintain “level playing field”
  - Current HUD Std. results in “cheating”; no current enforcement of non-compliant off-shore production
- Raw boards enforcement
- Finished product enforcement

## Proposed ATCM Enforcement Program

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- Need new infrastructure for effective enforcement
  - Personnel needs
  - Field test apparatus–
    - Small chamber for ASTM D6007
      - ◆ Evaluate applicability to finished products
    - Other field instruments (eg. portable HCHO detector)
  - ATCM stds. validation– Large chamber for ASTM E 1333
    - Contract testing; ARB large chamber (requires funding)

## ARB ATCM Enforcement Approach

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- Direct enforcement activities at facilities
  - Testing; audits (chain-of-custody/records)
- Potential enforcement under ARB's program on ports
- Joint enforcement activities with USEPA, US customs and local air pollution control districts
- Work with the CA. bldg commission to integrate CWP ATCM stds. into building permitting requirements (eg. windows, doors and cabinets)
- Follow up on complaint hotline

## CWP ATCM Enforcement *Raw Boards*

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- Enforcement at mfg. plants– 3<sup>rd</sup> party certification
  - Provides ARB oversight at any point of CWP mfg, distribution and retail
  - Laboratory certification (domestic and international)
- Enforcement at distribution, fabricator and retail
  - ARB enforcement approach

## ARB Enforcement Approach

### *Raw Boards*

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- Used by ARB to conduct enforcement activities
- Elements
  - Sampling procedures by staff (applies to mgfrs., distributors, fabricators & retailers)
  - Testing and analytical methods
    - Field apparatus– Small chamber
    - Regulatory Standard– Large Chamber
    - Specificity regarding acceptable analytical methods
  - Chain-of-custody requirements for enforcement samples

## CWP ATCM Enforcement

### *Finished Products*

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- Chain-of-custody
- 3<sup>rd</sup> party certification program for finished products?
- Enforcement activities will target companies responsible for most finished products in CA
- Enforcement activities will target imported furniture as major source of imported CWPs
- Screening method



# Economic Assessment

## **Economic Analysis**

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Government Code Section 11346.3 requires state agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any regulation

## Affected Businesses

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- Composite Wood Manufacturers
- Resin Producers
- Fabricators
- Distributors
- Retailers
- Consumers

## Manufacturer Costs

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- Additional research and development in manufacturing technology
- Upgrading or converting existing plants to accommodate a new resin system (e.g. mixer/spreader)
- Added investment in QA/QC systems
- Additional product emission testing by a certified lab
- Higher resin cost
- Recordkeeping

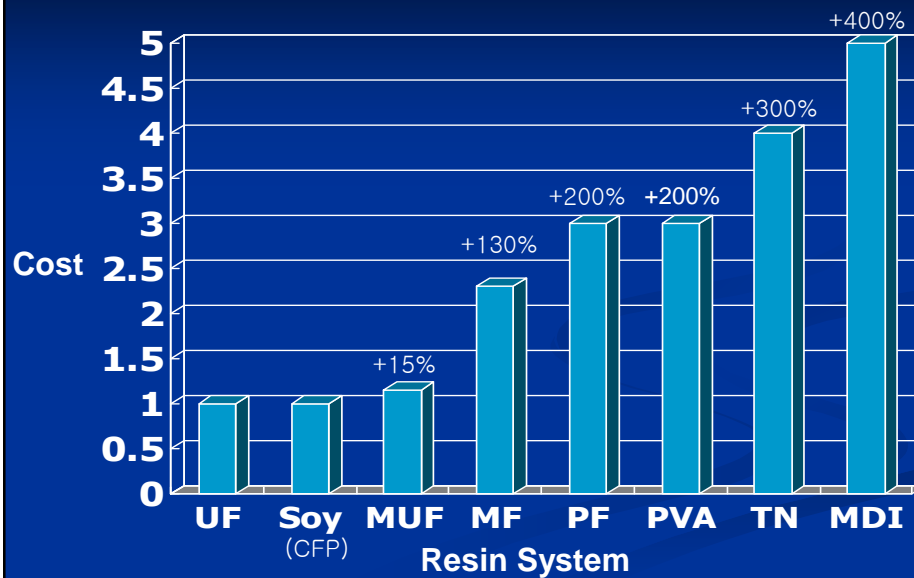
## Manufacturing Cost Analysis

Total  $\Delta$  Manufacturing Cost =

$\Delta$  Resin Cost +  $\Delta$  Capital Cost +  
 $\Delta$  Production Rate Cost +  
 $\Delta$  Energy Cost

Total cost will vary from company to company depending on current production capabilities

### Resin Compared to UF Costs



## Capital Cost

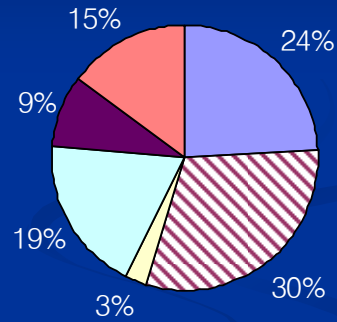
- Plant modifications required
  - Blenders
  - Resin Tanks
  - Furnish Drying Capacity
- Degree of modification differs from plant to plant for both Phase 1 and Phase 2

## Resin Energy Cost and Production Rate *Compared to UF*

	Press Time	Press Temp	Net energy Cost	Production Rate
UF	Standard	Standard	<u>Standard</u>	<u>Standard</u>
MUF	Longer	Higher	<u>Increase</u>	<u>Decrease</u>
PF	Longer	Higher	<u>Increase</u>	<u>Decrease</u>
PMDI	Standard	Standard	<u>Standard</u>	<u>Standard</u>
Soy	Standard	Standard	<u>Standard</u>	<u>Standard</u>
PVA	Shorter	Lower	<u>Decrease</u>	<u>Increase</u>

## Distribution of Particleboard Manufacturing Cost

- 1 Net wood cost – 24 %
- 2 Adhesive – 30 %
- 3 Wax – 2.6 %
- 4 Labor – 18.9 %
- 5 Electricity – 8.6 %
- 6 Supplies/ Misc.- 14.6 %



Source: Resource Information Systems Inc.

Wood Products Review, 1997

Cited in *Canadian Forest Industries Wood-Based Panel Products: Technology Roadmap II. Panels in Perspective Table 2*

## Regulation Cost Estimate Particleboard

### Current Wholesale Cost

- \$6.88 <sup>1/</sup> per 4' x 8' sheet
- 30% is resin cost: \$2.06

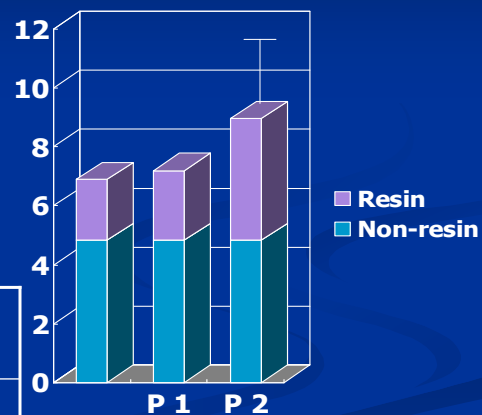
### Phase 1

Resin Cost Increase by 15%

### Phase 2

Resin Cost Increase by 100%

	Current Wholesale \$6.88	Overall Increase %
Phase 1	\$7.19	+ 4.5%
Phase 2	\$8.94	+ 30 %



<sup>1/</sup> Random Length Price

## Distribution of MDF Manufacturing Cost

1 Net wood cost – 29%

2 Adhesive – 27%

3 Wax – 3%

4 Labor – 15%

5 Electricity – 10%

6 Supplies/ Misc.- 16%

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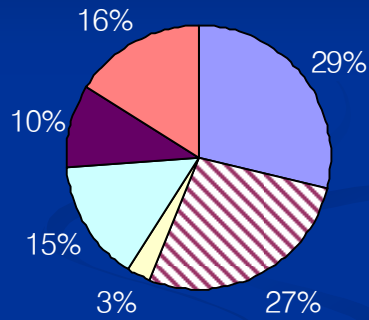
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Source: Resource Information Systems Inc.

Wood Products Review, 1997

Cited in *Canadian Forest Industries Wood-Based Panel Products: Technology Roadmap II. Panels in Perspective Table 2*

## Regulation Cost Estimate MDF

### Current Wholesale Cost

- \$9.60 <sup>1/</sup> per 4' x 8' sheet
- 27% is resin cost: \$2.59

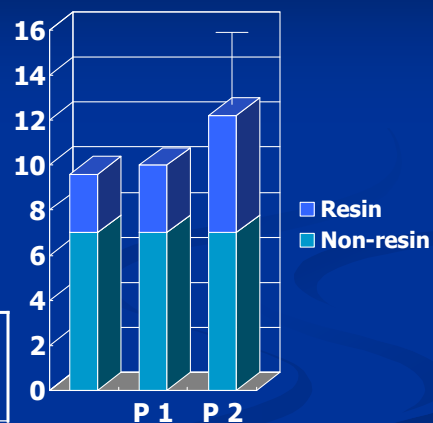
### Phase 1

Resin Cost Increase by 15%

### Phase 2

Resin Cost Increase by 100%

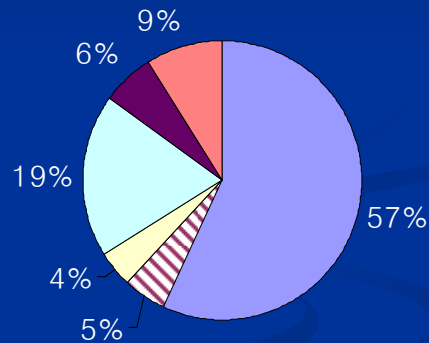
	Current Wholesale \$9.60	Overall Increase %
Phase 1	\$9.99	+ 4 %
Phase 2	\$12.19	+ 27 %



<sup>1/</sup> Random Length Price

## Distribution of Hardwood Plywood Manufacturing Cost

- 1 Wood – 57%
- 2 Adhesive – 5%
- 3 Maintenance – 4%
- 4 Labor – 19%
- 5 Electricity – 6%
- 6 Supplies/ Misc.- 9%



Source: United States Dept. of Agriculture

General Technical Report FPL-GTR-90

Capacity, Production, and Manufacture of Wood-Based Panels in the United States and Canada

## Regulation Cost Estimate Hardwood Plywood

### Current Wholesale Cost

- \$40 per 4' x 8' sheet
- 5 % is resin cost: \$2

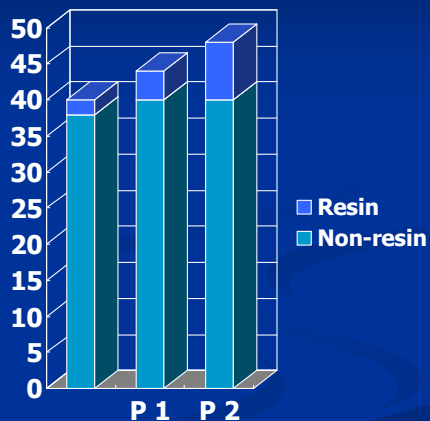
### Phase 1

Resin Cost Increase by 200% (PF)

### Phase 2

Resin Cost Increase by 400%  
(PVA)

	Current Wholesale \$40	Overall Increase %
Phase 1	\$44	+ 10 %
Phase 2	\$48	+ 20 %



## **Resin Producers**

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- Most resin companies provide wide array of resins
- Resin prices are mainly affected by the cost of raw materials
- Technical assessment for Phase 2 stds.
- Incremental cost of resin production to be passed to manufacturers

## **Cost to Fabricator, Distributors, Retailers**

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- Cost of non-compliant products after implementation
- May incur some costs to develop a tracking system to document purchases and sales
- Costs may be likely passed on to consumers



## ATCM Consumer Cost

- Kitchen Remodel Example
  - Remodeling with compliant products will cost \$90 more for end users
- Staff also developing incremental consumer price for new house and furniture

## Next Steps

Public Workshop	June 20, 2006
2 <sup>nd</sup> Public Workshop	Mid-July
45-day Comment Period	August 11, 2006
Board Hearing	September 28-29, 2006



California Environmental Protection Agency  
**Air Resources Board**